

## Fast Fiber-Coupled Imaging of X-Rays Events, Phase I

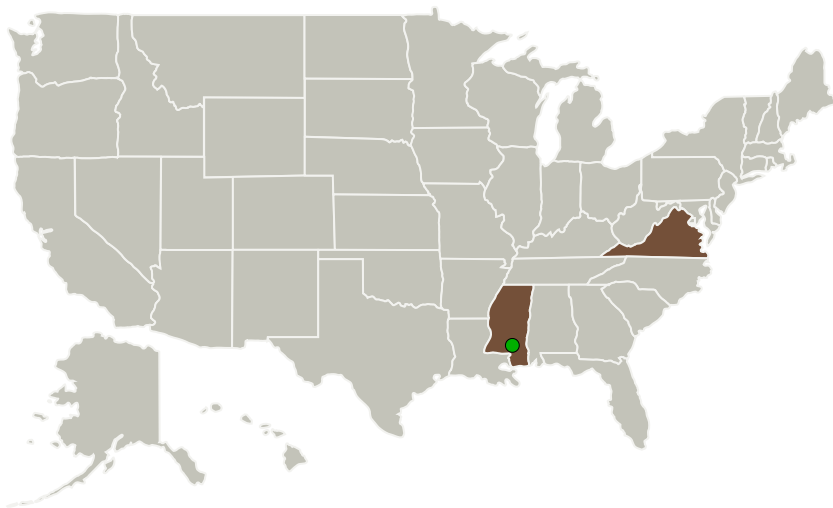
Completed Technology Project (2016 - 2016)



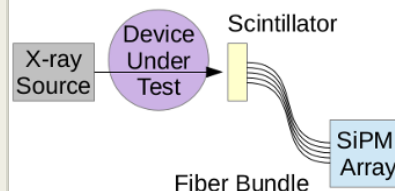
## Project Introduction

HyperV Technologies Corp. proposes to construct a long-record-length, fiber-coupled, fast imaging diagnostic for recording X-ray back-lit material flows and X-ray emission events. X-ray imaging of material flows in detonation fronts and combustion through protective housings has many important aerospace, industrial and defense implications. First HyperV will design, construct and test, in conjunction with UAH, a single fiber coupled X-ray scintillator pixel. Silicon Photo-multipliers will be investigated to maximize channel properties for the accepted cost and desired scalability. Next we will develop an X-ray imager of at least 16 pixels for observing X-ray backlit material flows based off of the single channel experiments. A camera performance of at least 2500 frames at 10 Megaframes per second with at least 12-16 bits per pixel will be targeted. X-ray emission from backlighter will be shone through a rocket motor and projected onto a scintillator. The optical emission from the scintillator is then observed by a fiber imaging grid. The imaging grid would then couple light to a bank of amplified SiPM pixels with integrated analog gain and data acquisition. HyperV has already demonstrated as part of previous work a two clock domain technique for using slow cheap micro-controllers to manage high time resolution data acquisition over long record-length with a low cost digital backend. HyperV has also demonstrated that this back end can be used to observe SiPM as well as photodiode detectors. We propose now to extend these techniques observe X-ray induced emission of scintillator materials for performing time resolved imaging of X-rays. This small scale imager would then be used to observe material flows in rocket motors in the UAH X-ray laboratory as a demonstration of the diagnostics capability.

## Primary U.S. Work Locations and Key Partners



## High Speed Xray Imaging



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Organizations Performing Work	Role	Type	Location
HyperV Technologies Corporation	Lead Organization	Industry	Chantilly, Virginia
● Stennis Space Center(SSC)	Supporting Organization	NASA Center	Stennis Space Center, Mississippi

Primary U.S. Work Locations	
Mississippi	Virginia

## Project Transitions

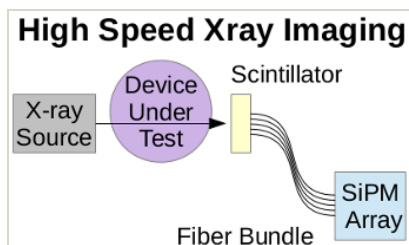
▶ **June 2016:** Project Start

✔ **December 2016:** Closed out

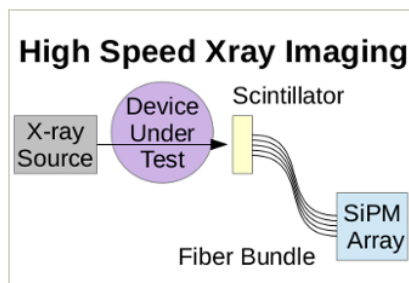
**Closeout Documentation:**

- Final Summary Chart(<https://techport.nasa.gov/file/139754>)

## Images

**Briefing Chart Image**

Fast Fiber-Coupled Imaging of X-rays Events, Phase I  
(<https://techport.nasa.gov/image/135895>)

**Final Summary Chart Image**

Fast Fiber-Coupled Imaging of X-rays Events, Phase I Project Image  
(<https://techport.nasa.gov/image/127932>)

## Organizational Responsibility

**Responsible Mission Directorate:**

Space Technology Mission Directorate (STMD)

**Lead Organization:**

HyperV Technologies Corporation

**Responsible Program:**

Small Business Innovation Research/Small Business Tech Transfer

## Project Management

**Program Director:**

Jason L Kessler

**Program Manager:**

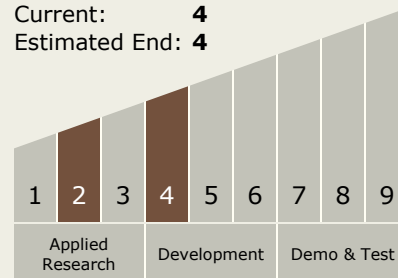
Carlos Torrez

**Principal Investigator:**

Samuel J Brockington

## Technology Maturity (TRL)

Start: 2  
Current: 4  
Estimated End: 4



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## Technology Areas

### Primary:

- TX13 Ground, Test, and Surface Systems
  - └ TX13.1 Infrastructure Optimization
    - └ TX13.1.5 Ground and Surface Logistics

## Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System